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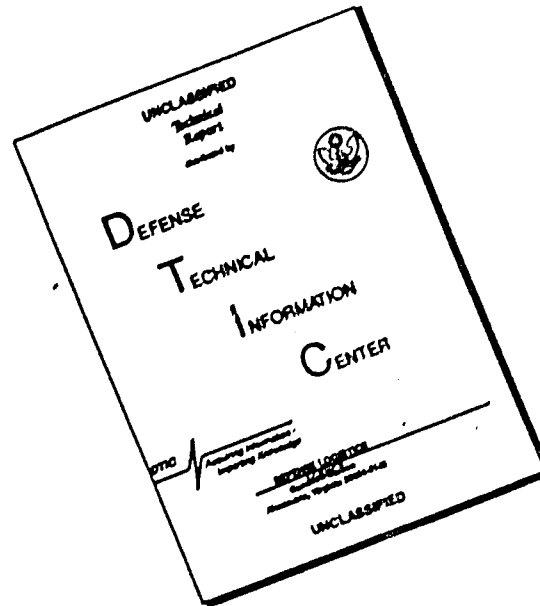
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DEPARTMENT OF THE ARMY
OFFICE OF THE ADJUTANT GENERAL
WASHINGTON, D.C. 20310

AD824754

IN REPLY REFER TO

AGAM-P (M) (25 Jan 67) FOR OT 660373

1 February 1967

SUBJECT: Operational Report - Lessons Learned, HQ 864th Engineer
Battalion (Construction)

TO: SEE DISTRIBUTION

1. Forwarded as inclosure is Operational Report - Lessons Learned, Headquarters, 864th Engineer Battalion (Construction) for Quarterly Period Ending 31 October 1966. Information contained in this report should be reviewed and evaluated by CDC in accordance with paragraph 6f of AR 1-19 and by USCONARC in accordance with paragraph 6c and d of AR 1-19. Evaluations and corrective actions should be reported to ACSFOR OT within 90 days of receipt of covering letter.

2. Information contained in this report is provided to the Commandants of the Service Schools to insure appropriate benefits in the future from lessons learned during current operations, and may be adapted for use in developing training material.

BY ORDER OF THE SECRETARY OF THE ARMY:

1 Incl
as

Kenneth G. Wickham

KENNETH G. WICKHAM
Major General, USA
The Adjutant General

JAN 9 1968

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(Distribution continued on page 2)

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Staff for some dev.
OT-RD
Wash. D.C. 20310

16

HEADQUARTERS
864TH ENGINEER BATTALION (CONSTRUCTION)
APO 96312

EGACBC-3

14 November 1966

SUBJECT: Operational Report - Lessons Learned (RCS CSFOR-65), for Quarterly
Period Ending 31 October 1966

THRU: Commanding Officer
35th Engineer Group (Construction)
APO 96312

Commanding General
18th Engineer Brigade
APO 96307

Commanding General
United States Army, Vietnam
ATTN: AVC-DH
APO 96307

Commander In Chief
United States Army, Pacific
ATTN: GPOP-MH
APO 96558

TO: Assistant Chief of Staff for Force Development
Department of the Army (ACSFOR DA)
Washington, D. C. 20310

Section 1. Significant Organization or Unit Activities.

1. The battalion has been heavily engaged in construction during this reporting period. The major vertical construction has been centered in the Cam Ranh Bay Depot complex and the surrounding local areas. The major percentage of the battalion's horizontal construction effort has been on Hon ~~The~~ Island in the vicinity of Nha Trang. The battalion has continued with its construction support activities of maintenance, quarry operations and asphalt and concrete production. The specific unit activities during the reporting period were as follows:

FOR OT RO
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a. Company A has been faced with the problem of substituting engines on critical pieces of construction equipment because of the unavailability of manufacturer's standard engines. This unit also has satisfactorily substituted other power assemblies.

b. Company B's significant projects are in three general areas; hardstands, drainage and vertical construction.

(1) A multipurpose hardstand known as the "Roll-on, Roll-off" was begun on 6 September and completed 19 October. The work consisted of in place soil-cement stabilizing 435,000 square feet and sealing the surface with asphalt cut back. The area was surfaced with pierced aluminum planking and surrounded with creosoted poles for curbing.

(2) Another hardstand, the POL Hardstand, was begun on 22 August and is now virtually complete. The area encompassed 202,000 square feet which had to be graded and covered with Republic Steel Matting and pierced aluminum planking.

(3) The depot area drainage project consisted of excavating and stabilizing the ditches and constructing drainage structures. The major problem encountered on this project was the stabilization of the ditches which had been constructed previously through dune sand areas, with sides too steep. We used sand bags filled with a 10% sand-cement mixture.

(4) Thirty-two thousand feet of refrigerated storage was constructed.

(5) A fourteen acre plot of land and four hundred seventy-five meters of two lane roadway were brought to grade for the Vinnell Corporation.

(6) A major self help project was begun on 15 September for the construction of a cantonment area for 416 men. The project is not complete, but the billets and orderly rooms are occupied.

(7) A major earthmoving project, the preparation for a new 8,630 man cantonment area, was begun on 29 October with an anticipated initial occupancy date of 15 January 1967.

(8) Two technical assistance projects were undertaken, one to assist the 71st Artillery construct billets and the other to assist the 124th Transportation Command erect a headquarters complex.

(9) Road construction during the period consisted of the base preparation for 4,000 feet of road near the 6th Convalescent Center.

c. Company C. The earthmoving project at Hon Tre Island has been the most significant activity of this unit during the reporting period. A

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total of 83% of the project has been completed. The road up the mountain has been brought to grade (20% maximum), and 5,760 feet of the 14,500 feet of road has been rock surfaced. The total earthwork during this period was 212,000 cubic yards.

d. Company D. Projects during the reporting period included the following: Construction of 2.2 miles of soil-cement stabilized, asphalt paved roads; construction of a prefab yard and shop, and pre-fabrication of single story and double story 20' x 120' tropical buildings; installation of various length and size corrugated metal pipe culverts with sandbag head-walls; one reinforced concrete box culvert; continued construction of the Data Processing Center; placement of reinforced concrete slabs; road maintenance; shoulder stabilization and grading 144,000 square feet for a Roll-on, Roll-off area.

e. 102nd Engineer Company (Construction Support). This unit was engaged in asphalt paving and quarrying operations of a massive scope quite uncommon to the Engineer Construction Support Company. The unit operates the 864th Engineer Battalion quarry, a complex consisting of the quarrying equipment and personnel of this company and Company "A" of the battalion. Several rock crushers, in addition to those authorized by combined TO&E's, are in the quarry complex, as are numerous heavy duty, non-standard, tracked pneumatic drifter rock drills. The average blast rock production was 7,100 tons per week; average asphalt production was 1,860 tons.

2. The battalion was engaged in training thirteen half-days during this reporting period. Training has been conducted as follows:

a. On Sunday mornings, subjects required by current directives and regulations.

b. Day to day technical training of small groups of various skills, and follow-up on the job training.

c. Officer and NCO classes were conducted twice weekly on such subjects as equipment maintenance and operation.

Section 2, Part I, Observations (Lessons Learned).

1. Organization

Task Oriented Organization

ITEM: Reorganization of Engineer Battalion (Construction) to a task oriented organization.

DISCUSSION: The Engineer Battalion (Construction), TOE 5-118D, is organized with three identical construction companies. This allows each company to

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perform on a detached status. However, for heavy construction in rear areas, when the battalion is usually in a static situation, a task oriented organization would greatly increase efficiency and productivity.

OBSERVATION: A method of task organization suggested for this battalion would be somewhat different than one for a battalion with all three of its line companies in one location, but the principles would remain the same. The task organization would consolidate earthmoving platoons in one company and construction platoons in another. Within the earthmoving company, task organization could once again be employed. For example, grouping might consist of wheeled tractors and scrapers, tracked tractors, "low bed" tractors and trailers, etc.

2. Equipment;

Substitution of Engines

ITEM: Installation of Continental Engine, Model FS-162, in 16 S Cement Mixer.

DISCUSSION: Problems were encountered because the model FS-162 is a slightly larger engine and has a larger bore and stroke. Mounting frames had to be prefabricated to match clutch mountings and the radiator.

OBSERVATION: It is felt that the Model FS-162 Continental Engine will have a longer life since it has a larger bore and stroke and handles the job with ease at the rated RPM of the mixer.

ITEM: Installation of V-71 Detroit Diesel in Pioneer Screening and Crushing Plant, 225 TPH

DISCUSSION: No major problems were encountered in the exchange. The engine frame had to be modified slightly.

OBSERVATION: There was no noticable improvement in the performance of the crusher. The increase of the horsepower will increase the production of the plant.

Construction Equipment

ITEM: The Equipment Authorized in the Engineer Battalion (Construction)

DISCUSSION: It is often claimed that the Engineer Battalion (Construction) TOE 5-118D, is organized and equipped to perform a wide variety of missions in any region of the world. In fact, we are equipped to do most things poorly and nothing to the high standards which should be expected of high quality, efficient construction. The construction company is equipped with medium, full tracked tractors identical to those in combat engineer battalions, transportation battalions, and other units. This does have the one

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advantage of standardization but does not permit efficient massive earth work projects. The same type problem exists with the 18 cubic yard scraper, the 5 ton dump truck, 16S mixer, the 1000 gallon water distributor, the compaction rollers, and the cranes. Further, there are many items needed but not in the TOE. Many of these items are rented or borrowed from the civilian contractors or obtained from Army sources by special authorization. These include 40 ton cranes, self propelled pneumatic rollers, self propelled roto-tillers, fork lifts, 225 TPH rock crushers, self loading conveyors, tracked loaders, tracked rock drills, 24 cubic yard self propelled scrapers, and heavy tracked tractors. In no instance has this equipment affected the mobility of the battalion. It has, however, greatly increased the productivity. Without it, Cam Ranh Bay roads would not be able to handle the tonnage they do, and supplies would have frequently been stopped due to washouts.

OBSERVATION: The equipment assigned to the Construction Battalion is not adequate. The construction battalion is required to construct facilities in conjunction with the rapidly expanding troop deployment to the Republic of Vietnam. Heavy construction equipment should be authorized these units to enable them to efficiently perform their missions.

ITEM: Selection of Better Drilling Equipment to Maximize Blast Rock Production.

DISCUSSION: The capability to drill holes for the placement of explosives is the most significant factor in blast rock production. Our quarrying operation uses both the military standard wagon drill and a heavier duty tracked drill. The following is a tabular comparison of drill capabilities:

	2" <u>WAGON</u>	3" <u>TRACKED</u>	4" <u>TRACKED</u>
Crew Required	4	3	3
Drill Capability (ft/hr)	15.0	20.0	18.0
Expected Production (tons/hr)	13.0	38.0	60.0

OBSERVATION: Military standard wagon drills are of limited value in the production of massive quantities of blast rock required by major quarrying operations. Incorporation of a heavier duty tracked drill into TO&E's would enhance production at major quarry complexes. Successive bit sizes should also be available.

3. Construction Operations

Prefabrication

ITEM: Prefabrication of Standard Tropical Buildings.

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DISCUSSION: A carpenter shop was constructed for the pre-fabrication of standard tropical buildings. As Vietnamese labor is used, the jigs were built lower than would be required for use by military personnel. An assembly line type of operation is utilized whereby a "cutting crew" does all of the sawing, a "stacking crew" places the cut materials near the jigs and a "carrying crew" brings the stock up to the saws. Jigs were constructed for the pre-fabrication of side panels, exterior and interior roof trusses and doors. Louver blocks are precut and stored in barrels or boxes.

OBSERVATION: This has proved to be an efficient operation. The use of the jig insures the standardization of the particular parts of the building. The use of Vietnamese labor has been very suitable and their proficiency has steadily increased.

Earthmoving Operations

ITEM: Tandem Loading Technique Employed.

DISCUSSION: Major earth work projects employed tandem loading of scrapers. This reduced the number of push dozers required and idle time for scrapers while they waited for a push. In sand, three 830M tractors and scrapers can be "chained" requiring only one dozer to assist them load.

OBSERVATION: Extreme caution should be exercised until all operators are thoroughly familiar with the operation and know what to do should one tractor jack-knife during the loading. With a little practice, all operators become very proficient in this method and production is increased as much as fifty percent.

Culvert Installation

ITEM: Sandbag Headwalls Employed.

DISCUSSION: Due to critical time frames for culvert installation, sandbag headwalls have been used on all CMP culverts. This required grading the back fill and ditch shoulders so that sandbags were stacked against the fill and not vertical. Soil-cement was used to fill the bags which can also be reinforced by driving re-rod down through the bags. Asphalt curbs around the tops of the sandbag headwalls and along the edges prevent erosion under the sandbags.

OBSERVATION: The sandbag headwalls have been used on numerous deep drainage ditches in and around the Cam Ranh Bay Depot complex. The sandbag headwalls have held during heavy rains since their installation.

Priming Techniques

ITEM: Time Intervals for Priming Various Materials

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DISCUSSION: Various materials for stabilizing roads exhibited characteristics which should be considered before tacking, priming and paving. When soil-cement is used, priming should be accomplished as soon as the soil-cement can withstand the weight of the distributor. This is usually four to six hours following the final rolling and grading. An MC 1 or 2 should be used with an application rate of 0.2 to 0.25 gallons per square yard. Following the prime coat, a period of not less than four days should be allowed before attempting paving operations in order to avoid steaming, and therefore failure, during paving.

When coral or laterite materials are used for stabilizing subgrades the prime coat is applied immediately after the final rolling and grading. The same type of prime coat and application rate is used. When coral is used a two day curing time should elapse before paving due to its high moisture content, and one day for laterite materials.

OBSERVATION: These techniques have been applied to an MSR and local roads in the area. The roads are subject to all types and classes of vehicles. After a period of over sixty days there is no evidence of any type of failure of either subgrade or asphalt pavement.

Building Materials

ITEM: Use of Locally Manufactured Brick.

DISCUSSION: Local bricks are made of red sandy clay not fired to the strength of standard American brick. They are softer and more subject to breakage through rough handling. A very important characteristic of these bricks is their affinity for water. Before laying the brick they were placed in a bucket of water, which is the standard procedure, so that they would not draw the moisture out of the mortar when placed. However, when the mason reached for the bricks, they had nearly dissolved and all that remained was a bucket of red mud. From then on all bricks were dunked and immediately placed. Each row was again sprinkled prior to placement of the next tier. Additional water was splashed on the brick just ahead of the mason to keep them as moist as possible. After completion of the basic structure the walls were plastered on the interior and exterior. Exterior plastering was accomplished on the shady side of the building and was stopped as soon as the sun shone on the new plaster. By doing so surface cracking was kept to a minimum and the masons were allowed more time to trowl before the plaster set up.

OBSERVATION: The inadequacies with locally manufactured brick were overcome by the technique employed.

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4. Quarry Operations

Blasting

ITEM: Maximizing Effectiveness of Blasting Operations.

DISCUSSION: The non-availability of free-floating granular ammonium nitrates has reduced the effectiveness of blasting operations. Explosive currently used is 60% gelatin dynamite, which has too high a detonating velocity, and caused residual air voids to be formed.

OBSERVATION: Free flowing granular ammonium nitrate used in conjunction with bottom hole detonation and with emphasis on adequate stemming would provide the most desirable blast.

5. Logistics

Non Standard Equipment

ITEM: Logistical Support of Non-standard Tracked Rock Drills

DISCUSSION: Problems have been encountered in resupplying bits, couplings, extension rods and repair parts for non-standard rock drills. A loss in excess of 4,000 drill hours or a potential production loss of 150,000 tons of aggregate has been sustained at the Cam Ranh quarry due to the lack of repair and operating parts.

OBSERVATION: Prior to deployment of major items of non-standard equipment on a mission basis, effective means of establishing responsive resupply of repair and operating parts should be established.

Section 2, Part II, Recommendations:

1. Organization: The Engineer Construction Battalion should be organized with functional type companies rather than having equipment scattered in small numbers through all companies.

2. Equipment:

a. An engine such as the Continental Model FS-162 Should be used on the 16S mixer.

b. An engine such as the V-71 Detroit Diesel should be used in the Pioneer 225 TPH crushing and screening plant.

c. Mission-essential items of equipment in the Engineer Construction Battalion should be of more productive types, of more recent design, and expanded to include many of the items non-standard to the construction industry.

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A separate study should be made of this matter in order to make a complete and accurate recommendation to Headquarters, Department of the Army.

d. Tracked rock drills and several drill sizes should be standardized and made available.

3. Construction Operations:


a. Local labor and mass production techniques should be employed when prefabricating several buildings of similar design.

b. Sandbags for culvert headwalls should be filled with a mixture of sand and cement (15% by volume). Headwalls should be made by stacking against the slopes and not vertical, approximately three bags thick.

c. Soil-cement road bases must be primed immediately following rolling and grading, but not paved for at least four days.

4. Quarry Operations: Granular ammonium nitrates should be made available.

5. Logistics: Repair parts and accessories such as drill steel and bits should be purchased concurrently with any procurement of non-standard rock drills.


RAY S. HANSEN
LTC, CE
Commanding

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Inclosure 1

EGA-3 (18 November 1966)

1st Ind

SUBJECT: Operational Report on Lessons Learned for the Period 1 August 1966
thru 31 October 1966 (TCS CSFOR-65)

HEADQUARTERS, 35TH ENGINEER GROUP (CONSTRUCTION), APO 96312, 18 November
1966

TO: Commanding General, 18th Engineer Brigade, APO 96307

1. In accordance with Department of the Army Regulations and U.S. Army Regulation 870-2, dated 19 July 1966, Subject: Operational Reports-Lessons Learned (TCS CSFOR-65), the subject report is forwarded for the 864th Engineer Battalion (Construction).

2. The report adequately covers the major activities of the 864th Engineer Battalion (Construction). The commanders recommendations and comments are generally concurred in and the following additional recommendations and comments are furnished:

a. Reference paragraph 1a, Section I. Due to the age and low density of certain items of engineer equipment, replacement engine assemblies have been scarce and in some instance, unavailable. In order to meet operational requirements, engines of makes and models other than those supplied by the equipment manufacturer have been installed. Operationally, this procedure has been successful; however, it has placed an additional burden on unit maintenance personnel and has created a unit supply problem of providing repair parts for these substitute engines.

b. Reference, Section 2, Part I, Task Oriented Organization. This Engineer Construction Battalion is subject to immediate assignment to Operational Support Missions. The ability of a construction company to operate on a detached status is necessary in the possible fluid status the battalion could find itself in, in any short period of time. Certainly both types of organizations have their advantages and disadvantages, however, the current organization has proven itself effective.

c. Reference Section 2, Part I, Construction Equipment. The Commander has apparently allowed his frustrations to temporarily overcome his good sense. Outdated and worn equipment pushed into service by the current emergency is a constant source of frustration. However, with a parts system that is becoming more responsive and a replacement system that is bringing in the first, new major equipment replacements, things are getting better. Within operational requirements, the highest standards possible are expected on all construction.

d. Reference Section 2, Part I, Quarry Operations. It is recognized that free-floating granular ammonium nitrate is a more effective explosive for quarry operations due to the slow velocity detonation characteristics. However, there are other characteristics which must be considered;

Inclosure 1

EGA-3

18 November 1966

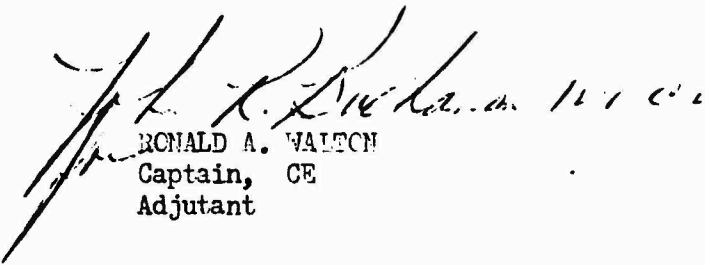
SUBJECT: Operational Report on Lessons Learned for the Period 1 August 1966 thru 31 October 1966 (RCS CSFOR-65)

ammonium nitrate is very susceptible to moisture and due to climatic conditions in Vietnam i.e., frequent high humidity and extensive monsoon periods the use of ammonium nitrate is not recommended for annual use. In addition there is an over abundance of 60% commercial dynamite in stock which must be used before it deteriorates. The Army does not issue the ammonium nitrate, but uses military explosives, because it better adapts itself to changing climatic conditions.

e. Reference Section 2, Part II, paragraph 1. As discussed in paragraph a, above, the Engineer Construction Battalion, with minor changes, is a satisfactory organization.

f. Reference Section 2, Part II, paragraph 2.c. The best combination of civilian designs, as long as militarily satisfactory, is of course desirable in any engineer organization.

FOR THE COMMANDER:


RONALD A. WALTON
Captain, CE
Adjutant

Inclosure 1

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AVBC-C (14 Nov 66)

2d Ind

SUBJECT: Operational Report-Lessons Learned (RCS CSFOR-65) for Quarterly
Period Ending 31 October 1966

Headquarters, 18th Engineer Brigade, APO 96307

16 DEC 1966

TO: Commanding General, United States Army, Vietnam, ATTN: AVC-DH,
APO 96307

1. This headquarters has reviewed the subject report, submitted by the 864th Engineer Battalion (Const), and considers it an adequate report of organizational activities for the quarter.

2. The observations and recommendations of the submitting commanders are concurred with, subject to the following comments:

a. Section 2, Part I, para 2a, 1st Ind. Substitution of Engines. Unit action to exchange engines or major components because of operational necessity must be done concurrent with submission of an EIR and then only with prior approval of local Support Maintenance Facility. Engineering problems in design of the basic unit which would not be noticed or known, by the unit making the change, could result in damage to the end item, other than from fair wear and tear (FWT), as defined in AR 711-16. Unit will be cautioned against modifying actions without prior approval of the responsible Support Maintenance Facility.

b. Section 2, Part I, para 1 and para 2b, 1st Ind. Task Oriented Organization. Concur with indorsing commander's observations. The TOEs have been studied and constantly redated through the years. Augmentation units and cells or detachments are available to augment the construction when the magnitude of the project so warrants.

c. Section 2, Part I, para 2 and para 2c, 1st Ind. Construction Equipment. Concur with indorsing commander's observations.

d. Section 2, Part I, para 2. Better Drilling Equipment. This is being done through CONUS higher headquarters action. The quarry drill set has been changed to include two track mounted drills in lieu of two wagon drills.

e. Section 2, Part I, para 3. Culvert Installation. Concur basically with commander's observation, except each headwall placed is a different engineering problem and must be solved, considering all factors. Factors to consider are: weather, slope, height, available materials, effort available, expense, the tactical situation and the life expectancy of the structure.

f. Section 2, Part I, para 3. Locally Manufactured Brick. Since this local brick has demonstrated such poor properties as described, the experience dictates that continued use be limited to above ground construction and set vertical with a cover shield, if at all possible, to deter erosion on the brick. Under no condition should such material be used for bearing walls or at a location where compressive strength is a critical parameter.

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2d Ind

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g. Section 2, Part I, para 5. Non-Standard Equipment. The 1st Logistical Command has been requested to provide an in-country source of non-standard equipment parts in order that they would be more readily available to units needs. From in-country visits by representatives of the Japanese Company supplying track mounted drills to the brigade units, it was determined that incomplete operator maintenance and lack of working knowledge of the drill contributed greatly to the deadline rate on these drills. As a result of this discovery the factory representatives conducted supervisor and operator classes on maintenance and operation of their concern's drills. Upon return to their concern's offices, they forwarded brochures on the drills for assistance in unit conducted classes for replacement operators training.

h. Section 2, Part I, para 4 and para 2d, 1st Ind. Quarry Operations. Concur with indorsing commander's remarks in non-issue of ammonium nitrates. There are commercial varieties of free running ammonium nitrates, such as "Pelletol", which are water resistant. However, the reason for any change to these blasting agents would be from an economic or safety standpoint for they are cheaper than dynamites and less sensitive to shock. But their lack of sensitivity requires a special primer and on holes depths greater than fifteen feet, multiple primers must be used. Free running agents have a low explosive density and their use is generally confined to large diameter drill holes, a type not drilled with military equipment. The recommended system, now used, is the dual electric cap initiation of the primacord system, utilizing milisecond (MS) primacord delay connectors.

FOR THE COMMANDER:

for *Richard B. Reynolds* Cpt CE
WAYNE J. REYNOLDS
Major, CE
Adjutant

AVHGC-DH (14 Nov 66) 3d Ind
SUBJECT: Operational Report-Lessons Learned for the Period Ending
31 October 1966 (RCS CSFOR-65)

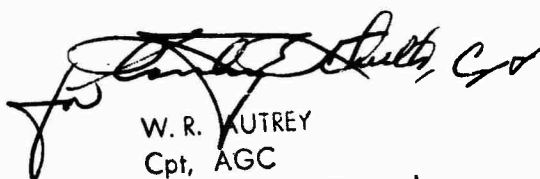
HEADQUARTERS, UNITED STATES ARMY VIETNAM, APO San Francisco 96307 28 DEC '66

TO: Commander in Chief, United States Army, Pacific, ATTN: GPOP-OT
APO 96558

1. This headquarters has reviewed the Operational Report-Lessons Learned for the period ending 31 October 1966 from Headquarters, 864th Engineer Battalion (Construction) as indorsed.

2. Concur with the basic report as modified by the previous indorsements.

FOR THE COMMANDER:



W. R. AUTREY
Cpt, AGC
Asst Adjutant General

Inclosure 1

GPOP-OT (14 Nov 66)

4th Ind

SUBJECT: Operational Report-Lessons Learned for the Period Ending
31 October 1966

HQ, US ARMY, PACIFIC, APO San Francisco 96558

14 JAN 1967

TO: Assistant Chief of Staff for Force Development, Department of the
Army, Washington, D. C. 20310

This headquarters concurs in the basic report as indorsed.

FOR THE COMMANDER IN CHIEF:



L. L. CHAPPELL
MAJ. AGC
A-1 AG